to have a secondary procedure such as a secondary lens implantation.

There are less accurate methods of "estimating" cell density using an ophthalmic slit-lamp microscope. This technique uses a simple estimating comparator and does not require the counting of cells in photographs.

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Corneal Transplantation

CORNEAL TRANSPLANTATION is an accepted and highly successful therapeutic tool in ophthalmologic surgical procedures. Advanced microsurgical techniques, increased understanding of transplant immunology and the availability of topical corticosteroids have afforded the corneal allograft a degree of success unmatched by transplantation attempts with other tissues. Allograft rejection remains, nonetheless, a problem. Graft rejection attempts occur in about 20% of patients, though the percentage of grafts opacified from immune rejection is considerably smaller.

The mainstay of preventive immunosuppressive therapy has been topical and systemic corticosteroids. The success of these agents depends to a great extent on the vascularity of the recipient bed. The prognosis for graft survival remains only poor to fair in cases in which the host cornea is heavily vascularized.

Despite the success of topical corticosteroids in controlling the graft reaction, they can be associated with potential side effects including steroid-induced glaucoma, cataract, bacterial superinfection and herpetic recurrences. Therefore, alternative methods of immunosuppression have been evaluated. Most recently cyclosporine, a potent T-cell inhibitor that has revolutionized vital organ transplantation when administered either topically or as a retrobulbar injection in the laboratory, has shown promise as a useful immunosuppressive agent in clinical corneal grafting.

Human leukocyte antigen typing has been neither necessary nor practical in corneal transplantation primarily because of the avascularity of the cornea. Recent studies have indicated, however, that in selected heavily vascularized (high-risk) patients, human leukocyte antigen crossmatching or negative crossmatching of circulating lymphocytotoxic antibodies may improve the prognosis for graft survival.

In most cases, however, the prognosis for an optically clear graft is very good. Recipients can be educated in the cardinal danger signs of graft rejection (pain, redness, decreased vision) and, with early recognition and prompt and aggressive local immunosuppression, a clear corneal graft can be maintained.

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Intraocular Lenses for Correction of Aphakia

BEFORE intraocular lenses, the vision of the average postcataract operation patient was corrected with either thick, heavy spectacles or contact lenses. Although most patients can eventually adjust to cataract glasses, problems with depth perception, restriction of peripheral vision and image magnification often remain. Contact lenses eliminate most of these optical problems but require some degree of manual dexterity and a healthy cornea. Despite improvements such as daily-wear soft and extended-wear contact lenses, many patients still fail to achieve satisfactory comfort or visual correction. Intraocular lenses return an eye to an optical condition similar to that preceding the development of the cataract.

The early history of intraocular lens implantation was fraught with problems. Such complications as dislocation, corneal edema, persistent inflammation, secondary glaucoma and endophthalmitis were disturbingly common. Improvements in the finishing, polishing and sterilization of implant lenses and in the surgical techniques have greatly reduced these complications. The specter of serious, unpredictable long-term complications has not materialized although a few lens styles have been associated with late corneal decompensation.

In 1978 the Food and Drug Administration (FDA) classified all intraocular lenses as investigational devices. More than 1 million lens implantations have been monitored. Based on the data from the first 50,000 lenses, the FDA has approved several lens styles from a variety of manufacturers.

Presently, the posterior chamber lens styles are the most popular. Anterior chamber lens styles are also used frequently for both primary and secondary implantations. The use of iris-supported lenses has declined substantially.

In 1982 about 70% of the patients in whom cataract extraction was done in the United States received an intraocular lens implant. Lens implants may now be considered in any cataract patient who has an otherwise healthy eye. Implantation is especially indicated when a patient is not likely to tolerate a contact lens or an aphakic spectacle. An increasing number of patients are receiving "secondary" implants when trials with aphakic contact lenses or spectacles do not prove satisfactory.

Controversy still exists regarding the lower age limit for implantation. Contraindications have been diminishing as experience has improved. Caution is advised in patients with only one eye, severe myopia, uveitis, glaucoma, diabetic retinopathy, corneal endothelial dystrophy or other progressive ocular diseases. Although intraocular lens designs and surgical techniques are still evolving, the improvements accomplished over the past two decades have made lens implantation safe and effective for most cataract patients.

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Ophthalmic Genetics: A New Synthesis

AS INFECTIOUS DISEASES such as rubella have been brought under control with improved public health measures and immunizations, genetic factors have become increasingly important causes of both congenital and acquired eye diseases, particularly in the pediatric age group. Although accurate statistics are not available in the United States, it is estimated that at least 50% of new cases of legal blindness (20/200, or less than 20 degrees of peripheral vision) in the pediatric age group can be attributed to genetic causes; the economic and social consequences of this visual impairment are devastating. An ophthalmologist assumes a central role in identifying the cause of such visual handicaps and may assist pediatricians or geneticists in establishing a diagnosis in an otherwise perplexing patient. Referral is of particular importance in the detection of unilateral visual impairment, as a child with good vision in one eye may be asymptomatic. The eye is affected relatively early in the course of many genetic metabolic diseases and an ophthalmologist may be the first physician consulted. For example, patients who have Spielmeyer-Vogt disease, a lipopigment storage disorder, may have decreased central vision and ophthalmoscopic findings compatible with juvenile macular degeneration; progressive mental deterioration and visual impairment ensue. For some disorders, such as mannosidosis and Fabry's disease, the ocular manifestations are unique and diagnostic.

The hereditary bases of diseases that affect the eye include all three broad categories: chromosomal aberrations, single gene mutations consistent with Mendelian inheritance patterns and multifactorial inheritance. Some hereditary disorders that affect the eye have multiple genetic causes. The incidence of retinitis pigmentosa is about 1 in 3,000, much more common than would be expected from a disease caused by a single gene. Inheritance follows autosomal-dominant, autosomal-recessive and X-linked patterns. Although retinitis pigmentosa was thought to be a hereditary disease in all cases, a recent analysis of a large group of patients using segregation analysis, a complicated mathematical model, showed that some forms are not hereditary; the responsible environmental factors are not yet known.

The story of retinoblastoma has recently been unraveled. Strong evidence implicates a gene for this ocular malignancy on the short arm of chromosome 13 near the gene for esterase D, an enzyme that is unrelated to retinoblastoma. It is now believed that both the hereditary and the chromosomal forms of the disease are caused by an abnormality of the same gene. Neither the DNA sequence nor the biologic function of this oncogene has been identified.

The precedent for bringing a lawsuit for a wrongful birth has been set in the state of California by several cases that have been decided by the Supreme Court. Ophthalmologists and other physicians should consider the possibility of genetic factors in their visually handicapped patients; geneticists are well trained to relay information about hereditary disorders and congenital malformations without imposing value judgments.

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Laser Treatment for Glaucoma

THE OPHTHALMIC LASER was one of the earliest clinical applications of laser technology to medicine. Treatment of ocular disease primarily involved laser therapy for diseases of the macula, retinal tears and diabetic retinopathy. More recently, the argon laser has become a significant aid in the surgical treatment of both open-angle and closed-angle glaucoma. By using the laser, the number of patients requiring a conventional glaucoma operation has been reduced along with the associated complications, prolonged hospital care and inconvenience to patients and physicians.

Argon laser trabeculoplasty is the procedure used for open-angle glaucoma. Currently, it is the primary procedure of choice when the intraocular pressure cannot be adequately controlled medically. By placing small laser burns in the trabecular meshwork of the anterior chamber, the outflow facility of the eye increases and the intraocular pressure decreases. The 50 micron-sized burns are not full thickness, but cause stretching of the adjacent trabecular meshwork and enlarge the outflow channels. The surgical procedure is done on an outpatient basis, requires only topical anesthesia and is associated with minimal patient discomfort. Long-term follow-up is not available as the procedure first became a clinical research tool in the middle and late 1970s; however, three-year follow-up studies show an average decrease in intraocular pressure of 6 to 8 mm of mercury.

The optimal number of burns, their exact placement and the extent of the angle area to be treated are issues still under investigation.

For surgical management of cases of narrow (occludable) anterior chamber and narrow-angle glaucoma, argon laser iridotomy has replaced surgical iridectomy in all but the most difficult cases. This procedure is also done on an outpatient basis with topical anesthesia and minimal discomfort. In laser iridotomy, light is absorbed by the melanin pigment in the iris. The heat generated from the laser burn produces a